

THEORY AND METHODS IN EPIDEMIOLOGY AND BIOSTATISTICS

CU characterization:

CU name:

Theory and Methods in Epidemiology and Biostatistics

Scientific area acronym: SI Duration: Semiannual Working hours: 56 hours Contact hours: 20 hours ECTS: 2 Observations: N/A

Teacher in charge and respective teaching load in the CU: Sofia Seabra – 20 hours Maria do Rosário O. Martins – 0 horas

Other teachers and respective teaching load in the CU: $\ensuremath{\mathsf{N/A}}$

Intended learning outcomes (knowledge, skills and competences to be developed by the students):

At the end of the CU, students must understand and apply essential concepts of epidemiology and biostatistics, incorporating their methodological rigor into research in Medical Microbiology. Students should be aware of the limitations of their training, seeking exchanges with epidemiologists and statisticians on methodological aspects that require more solid mathematical and epidemiological foundations.



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At the end of the course, students should:

• Demonstrate that they understand the importance of using epidemiological methods and statistics in designing research projects;

• Know how to calculate, interpret and summarize the results of descriptive statistics and exploratory data analysis;

• Choose, perform and interpret the results of statistical tests (parametric and non-parametric), with emphasis on verifying their assumptions;

• Estimate the sensitivity and specificity of laboratory techniques;

• Know the main epidemiological studies, highlighting their advantages and limitations.

Syllabus:

1. The importance of statistics and epidemiology in biomedical research;

2. Principles of epidemiology applied to research; stages of research, characteristics of different epidemiological studies and their measurements; notions of chance, bias, causal relationship; strategies for controlling confounding variables;

3. Some notions of descriptive statistics and exploratory data analysis;

4. Introduction to statistical inference. The importance of the assumptions of parametric hypothesis tests and the care taken in interpreting results. Non-parametric alternatives;

5. Diagnostic tests: statistical methods for estimating sensitivity, specificity and predictive values.

Evidence of the syllabus coherence with the CU intended learning outcomes:

The course will begin by focusing on the need for statistics and epidemiology to intervene in a timely manner in the research plan. Some types of epidemiological studies will be discussed. Descriptive statistics and exploratory data analysis will focus on the interpretation and organization of data in tables and graphs that are more appropriate for theses and scientific articles, encouraging organization according to the statistical inference to be made, if applicable. Measures of frequency, effect and association will be discussed according to the type of study. In estimation by confidence intervals and hypothesis testing, the first objective will be revisited, discussing the calculation of sample size. Parametric and non-parametric tests will be addressed in parallel to encourage the verification of assumptions and discuss their respective advantages and disadvantages. Diagnostic tests and other epidemiological concepts will be addressed from an applied perspective and fostering methodological rigor.

Teaching methodologies (including assessment):

The total contact hours (20 hrs.) will be distributed across 8 theoretical-practical classes (16 hrs.), 1 group work presentation session (2 hrs.) and a written exam (2 hrs.). The total number of hours of work for the student is estimated at 56 hrs. In the theoretical-practical classes, statistical programs (SPSS, EpiTools or others) are used, as well as other resources and online platforms (e.g. Moodle). In order to be able to submit the assessment, students must attend at least 2/3 of the classes (signature registration on attendance sheets required). The assessment includes the presentation of a group work (10%) and a written exam (90%) that includes multiple-choice, true/false and other development questions, lasting two hours. To pass, a minimum grade of 9.50 is required in each of the assessment elements.



Evidence of the teaching methodologies coherence with the CU intended learning outcomes:

Classes will be theoretical and practical, involving alternating periods of presentation, problemsolving and database analysis using statistical programs. Students are encouraged to analyze their own data, if possible. Discussion of flaws and limitations in scientific articles will be encouraged and monitored by the teacher. Throughout the course, a dynamic teaching-learning methodology is intended to be used, stimulating interaction and active participation of students.

References for consultation / mandatory existence:

- Armstrong, R.A., Hilton, A.C. (2010) Statistical Analysis in Microbiology: StatNotes. WileyBlackwell.
- Bopal, R. S. (2008) Concepts of epidemiology. Oxford University Press, 2nd Ed.
- Daniel, W.W. (2004) Biostatistics: a foundation for analysis in the health sciences. John Wiley & Sons,8th Ed.
- Paulson, D.S. (2008) Biostatistics and Microbiology. A Survival Manual. Springer, 1st Ed.
- Sheskin, D. J. (2007) Handbook of Parametric and Nonparametric Statistical Procedures. Chapman& Hall/CRC.4th Ed.